

Forecasting Activity Key

*** For ease of use during class, the teacher key pages are numbered the same as the student book pages ***

I. Introduction

How often do you watch the weather on TV or listen on the radio for the weather forecast? The weather affects everything from afternoon swim practice to attacks on enemy forces during wars.

Weather forecasting used to be thought of as witchcraft. Those caught forecasting were punished. Today, we rely heavily on weather forecasters to help us plan our days and prepare for life-threatening conditions.

Some people "feel in their bones" when a storm is coming. Some people watch the animals and plants to know when it is about to storm. Those of us with televisions and radios don't have to wait for sparrows to fly by, we can just watch or listen to the weather forecast.

Get Info Objectives

1. Draw examples of weather map symbols.
2. Define common weather terms.
3. Explain weather systems.

Gather Data Objectives

1. Interpret temperature, wind, pressure, and cloud maps.
2. Draw cloud positions based on pressure maps.
3. Forecast the position of clouds three days from today.

Application Objectives

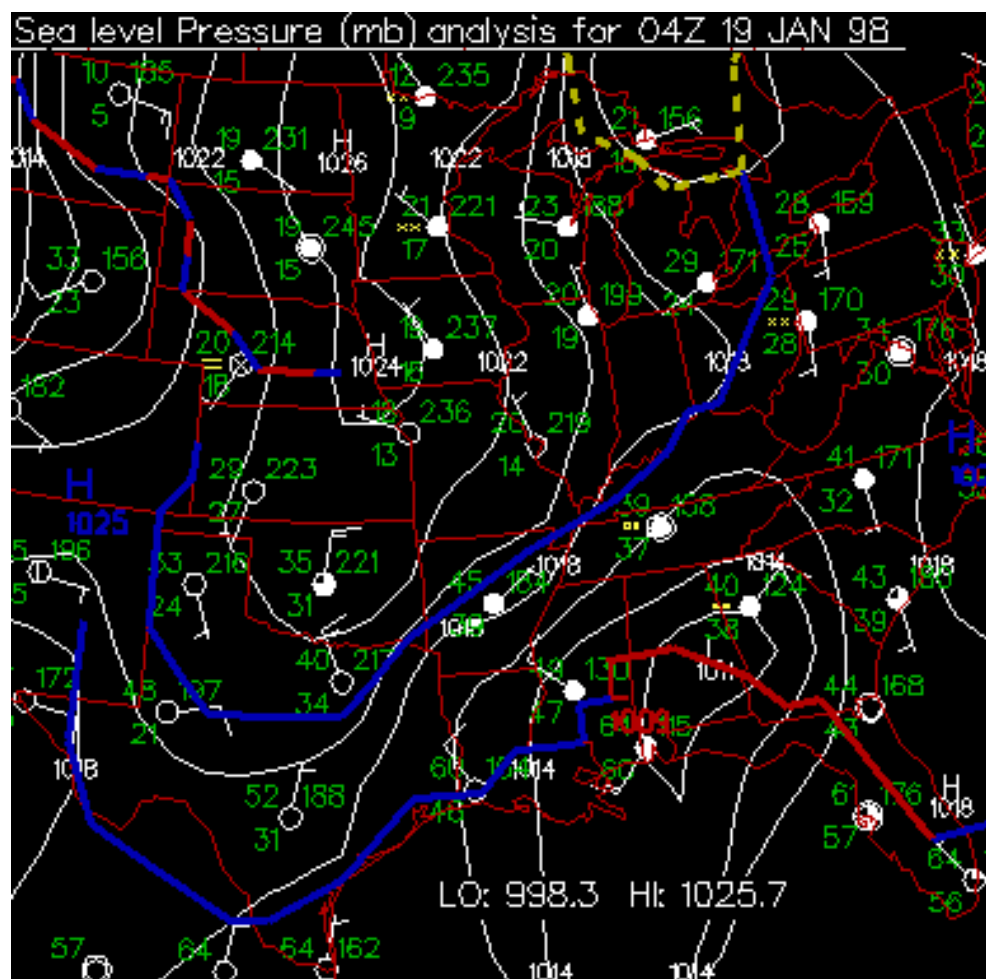
1. Relate temperature maps to pressure maps.
2. Relate pressure maps to wind maps.
3. Relate wind chill to wind and temperature maps.

II. Get Info

This section of this activity is called *Get Info*. The job of weather forecasters is to get information on weather events and pass it on to you. This is so you can plan your day, week, or plan for severe weather such as tornadoes, hurricanes, or thunderstorms.

It has been said that a picture is worth a thousand words. Below is a weather map. Just think of how many words it would take to describe all the information in this picture.



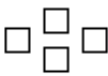



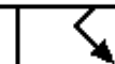
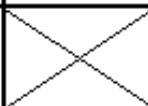




To understand the picture and all the information it has, start the activity and learn about what the map tells you.



A. Weather Symbols

- Click on the "Symbols" site.
- Read the chart and fill in the following common symbols.

1. Common Weather Symbols Chart

	Light	Moderate	Heavy
Rainfall			
Snow			
Thunderstorm			
Lightning			

- Click the "Back" button in the bar at the top of your web browser until you get back to the OAR Forecasting Get Info site.

B. Cloud Cover Symbols

- Click on the "Project Cloud Cover" site" created by the University of Illinois at Urbana - Champaign WW2010.

1. How would you show the skies were about 50% cloudy?

Fill in 1/2 of the circle on the wind barb.

- Click "Back" until you get back to the OAR Forecasting Get Info site.



C. Wind Speed Symbols

- Click on the "Project Wind Speed Symbols" site created by the University of Illinois at Urbana - Champaign WW2010.
- Read pages 1 through 3.

1. How do you show the direction that the wind is blowing from?

The wind direction is shown by the pole (wind barb) pointing

upwind (the direction the wind is blowing from).



2. What is the relationship between the length of the lines on the wind barb and the speed that the lines indicate?

Short lines are 5 knots, long lines are 10 knots. The long

lines are added to the pole as necessary to get up to 40

knots. Pennants are 50 knots.

3. Write a sentence describing a wind barb showing that a southerly wind is blowing about 15 knots with clear skies.

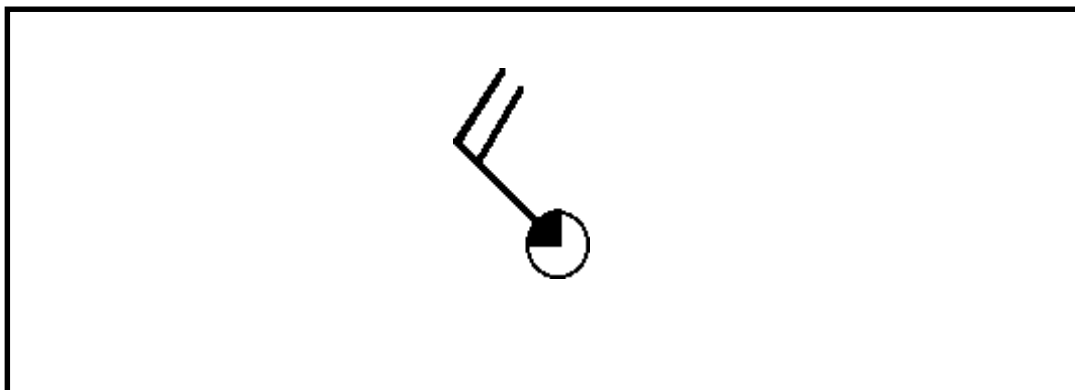
A wind barb showing clear skies has an unshaded circle with

a pole sticking out to the south with a long string at the end

of the pole and a short string towards the circle, both of

which are pointing to the west.

4. Draw a wind barb showing a northwesterly wind blowing at 20 knots with 25% cloud cover.



5. Convert 20 knots to miles per hour.

$$\frac{20 \text{ knots}}{1} \times \frac{1.15 \text{ mph}}{\text{knot}} = 23 \text{ miles per hour}$$

6. Draw a wind barb showing 86 mile per hour southwesterly wind and overcast skies. (First, convert miles per hour to knots.)

$$\frac{86 \text{ mph}}{1} \times \frac{1 \text{ knot}}{1.15 \text{ mph}} = 75 \text{ knots}$$





- Click "Back" until you get back to the OAR Forecasting Get Info site.
- Click "Forward" at the bottom of the screen.

D. Isobars



- Click on the " Project Isobars" site created by the University of Illinois at Urbana - Champaign WW2010.

1. What are isobars?

Isobars are lines connecting points of equal pressure.

2. How can we use isobars to show us the direction of the wind?

Stronger winds are associated with larger pressure gradients.

Larger gradients are indicated by having lines closer together.

- Click "Back" until you get back to the OAR Forecasting Get Info site.

E. Weather Maps



- Click on the "Weather Maps" site.
- Read section B and answer the following question.



1. How do weather maps help meteorologists?

Weather maps summarize what is happening in the atmosphere
at a certain time. Forecasters can use maps of different
levels of the atmosphere to conceptualize three dimensional
picture of what the atmosphere is doing.



- Click "Back" until you get back to the OAR Forecasting Get Info site.

F. Weather Systems



- Click on the "Weather Systems" site.
- Read sections A and B.

1. What causes weather systems ?

Warm air rises until it hits air that is the same temperature,
and cold air sinks until it hits air that is the same temperature.
The combination of warm rising air and cold sinking air results
in what we call weather systems.



2. Why do clear skies usually mean it's going to be cold?

Areas of high pressure tend to be clear and cold.

3. What type of pressure area (high or low) would you expect to be in during a thunderstorm? Low pressure

4. Does air in a high pressure area move towards a higher pressure area or towards a low pressure area?

Air sinks in high pressure areas until it hits the ground, then it

moves along the surface of the earth away from the high

pressure to a low pressure area.

- Click "Back" to get back to the OAR Forecasting main screen.

- Click "Gather Data".

III. Gather Data

A. Current Atmospheric Pressure at Sea Level

- Click on the "Weather Graphics" site.
- Scroll to "1. Sea Level Pressure."
- Click on "00 Hr (Initialization)."
- When the map downloads, follow the directions below to print it out in color or grayscale, or get a copy from your teacher.

- Netscape users

- Go to the File menu and select "Page Setup".
- IBM = Click paper size menu. Click "landscape".
- Macintosh = Click on the sideways piece of paper to let the printer print sideways.

- Internet Explorer users

- Go to the "File" menu.
- Select "Page Setup."
- Look in the "Orientation" box at the bottom left and change the orientation to "Landscape."



1. What is the pressure where you live?
(If you have difficulty naming the states, look at the map with the abbreviations shown after question 7 below.)

Today's pressure is answer will vary daily millibars.

2. What state(s) have the highest pressure on the map?

Answer will vary daily.

3. What state(s) has the lowest pressure on the map?

Answers will vary daily.

4. What states should have the highest winds? (If you have difficulty naming the states, look at the map with the abbreviations shown after question 7 below.)

The answer will vary daily, but the states with the most

isobars will have the highest winds because they have the

highest pressure gradient.

5. What direction are the highest winds blowing from?

Answers will vary daily.

6. What is the interval (pressure difference) between two adjacent (side by side) isobars? usually 2, sometimes 4 millibars
7. Using your knowledge of pressure and clouds, draw clouds on the U.S. Continental map where you think it would be cloudy.

clouds will be found at the sites of lowest pressure



8. On the map above, draw arrows showing the direction of the wind.

Arrows should point from high pressure areas toward low pressure areas.

- Click "Back" to get back to the "Weather Graphics" site.

B. Current Temperature at Sea Level

- Scroll down to "2. Temperature (in Fahrenheit)."
- Click on "00 Hr (Initialization)."





- When the map downloads, print it out in color or grayscale, or get a copy from your teacher.
- If you have trouble reading the map because of how light the state boundaries are, look back at the map of pressure and the labeled state map above.



1. Where is the coldest temperature on the map?

Answers will vary daily

2. Where is the hottest temperature on the map?

Answers will vary daily



- Click "Back" to get back to the "Weather Graphics" site.

C. Wind Maps



- Scroll down to "6. Wind."
- Click on "00 Hr (Initialization)."
- To read this map, remember how wind barbs are drawn to show the direction of the wind, and check your drawing to see if your wind direction arrows were done correctly.



1. Where is the wind blowing the strongest?

Answers will vary daily.



2. Where is an area of calm air surrounded by wind?

Answers will vary daily.



- Click "Back" to get back to the "Weather Graphics" site.

D. Rainfall

- Scroll down to "7. Precipitation" and click on "00 Hr (Initiation)."

1. How many millimeters of rain have fallen in your area during the past 6 hours?

Various mm

2. What is the relationship between the areas where it is raining and the pressure in those areas?

The lower the pressure, the more likely it will be raining.

- Click "Back" until you get back to the OAR Forecasting Gather Data site.

E. Satellite Cloud Picture

- Click on the "Satellite Images" site.
- Click on the blue text for today that includes "conus co4.jpg."
(The "conus" stands for continental US.)

1. Did you draw the clouds where they actually are when you answered question 7 in Gather Data section A? Yes or no

- Click "Back" until you get back to the OAR Forecasting main screen.
- Click "Application".

IV. Application

A. Forecasting

1. Using the information from the maps you have, forecast where the clouds will be in three days. Draw them in their new positions on the map of the United States on the next page.



Three days from the time you complete this activity, watch the news. Look to see where the clouds actually are to check your answer. You can also go back to the "Satellite Images" site in Gather Data section E and follow the directions to get the day's satellite image.



B. Wind Direction and Air Masses

1. If you were standing on the edge of a thunderstorm as it begins to form, would the wind be blowing into the storm or out of it, and why? (Review question E in the Get Info section if you need help.)


The wind blows into a young thunderstorm because the warm

low pressure air is rising.

C. How Maps Show Relationships among Weather Phenomena

- Look back at the pressure map you printed out in Gather Data section A.
- Compare it to the wind speed map you printed out in Gather Data section C.

1. How can you estimate the wind speed and direction using the pressure map?



Wind blows from high pressure to low pressure. The greater

the difference between the highest and lowest pressure, the

greater the wind speed.

- Look back at the pressure map you printed out in Gather Data section A.
- Compare it to the temperature map you printed out in Gather Data section B.

2. How are pressure and temperature related?

Usually higher pressure indicates cooler temperatures, but

not always.

- Look back at the pressure map you printed out in Gather Data section A.
- Compare it to the GOES (satellite) cloud image you printed out in Gather Data section E.

3. How are pressure and clouds related?

The clouds form in low pressure areas or along frontal

boundaries where high and low pressure areas meet.

- Click "Forward" at the bottom of the screen.

D. Wind Chill

- Click on the "Wind Chill" site.

1. What is wind chill?

Wind chill is the term used to describe the rate of heat loss

on the human body resulting from the combined effects of

low temperature and wind.



2. How does the wind chill affect your car?

Wind chill can cool it down faster, but not any colder than the
actual air temperature.

3. Calculate how cold it feels if the temperature is 10 degrees F and the wind is blowing 15 miles per hour. wind chill = 18 ° F

4. Calculate how cold it feels if the temperature is 35 degrees F and the wind is blowing 24 miles per hour. wind chill = 8 to 9 ° F

- Click "Back" until you get back to the OAR Forecasting Application site.

E. Use of maps

1. How does weather forecasting affect people's daily lives?

Answers will vary.

2. How does forecasting affect people's entertainment activities?

Answers will vary. Outdoor entertainment can be cancelled.

Planners for the event can use forecasting to plan for bad weather
and move the event indoors or under tents. You can dress
appropriately for the weather if you know what it will be like.

3. How would forecasting and archived weather knowledge affect planning festivals and other large public gatherings?

Answers will vary. Archived weather knowledge can be used

by planners to know what the temperature will probably be,

and if it is likely to rain during the festival or other gathering.

- Click "Back" until you get back to the OAR Forecasting main screen.
- Click "Enrichment".

V. Enrichment Activities

A. Newspaper Use

1. Collect the weather maps from your newspaper for one week. Glue or staple each one on a sheet of paper. After each day, make a prediction what the weather patterns will be for the next day. Check the weather map to see if you are correct.
2. Collect news articles about weather and its effects on areas and people. Summarize each article.

B. Observations

1. Record the types of clouds you see each day for five days (or longer). Draw and label each type. Visit the site below for pictures and explanations of cloud types <http://vortex.plymouth.edu/clouds.html>
2. Make a list of all the lyrics or song titles that are about weather.



C. Interviews

1. Interview a meteorologist from a radio or TV station. Develop a list of questions to ask this person over the phone. For example, find out what the job is like, what type of education is needed, and how computers help forecasting.
2. Interview your grandparents or other people about "folk tales" related to weather. For example, some older people say because their bones hurt, they know it's going to rain soon.



D. Measurements

1. Set up a weather station at home or school. You'll need a thermometer, barometer, anemometer, and hydrometer. Record the weather conditions and make predictions based on the data you collect. For help in taking measurements, go to the site below.
gopher://esdim1.esdim.noaa.gov:70/00/NOAA_systems/education/Weather/amateur_weather_forecaster
2. Record the amount of rainfall in your area for a month. Graph the amount each day on a line graph.



E. Related Web Sites

1. Weather Glossary
<http://www.nssl.noaa.gov/~nws/branick2.html>
 2. Radar Glossary
http://www-cmpo.mit.edu/Radar_Lab/Glossary.html
 3. Hydrologic (water related) Glossary
<http://www.crh.noaa.gov/hsd/hydefa-c.html>
 4. Reading and interpreting weather phenomena
[http://ww2010.atmos.uiuc.edu/\(Gh\)/guides/maps/home.rxml](http://ww2010.atmos.uiuc.edu/(Gh)/guides/maps/home.rxml)
 5. Weather charting
<http://athena.wednet.edu/curric/weather/graphing/index.html>
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